ACCESS TO LARGE SATELLITE DATA SETS

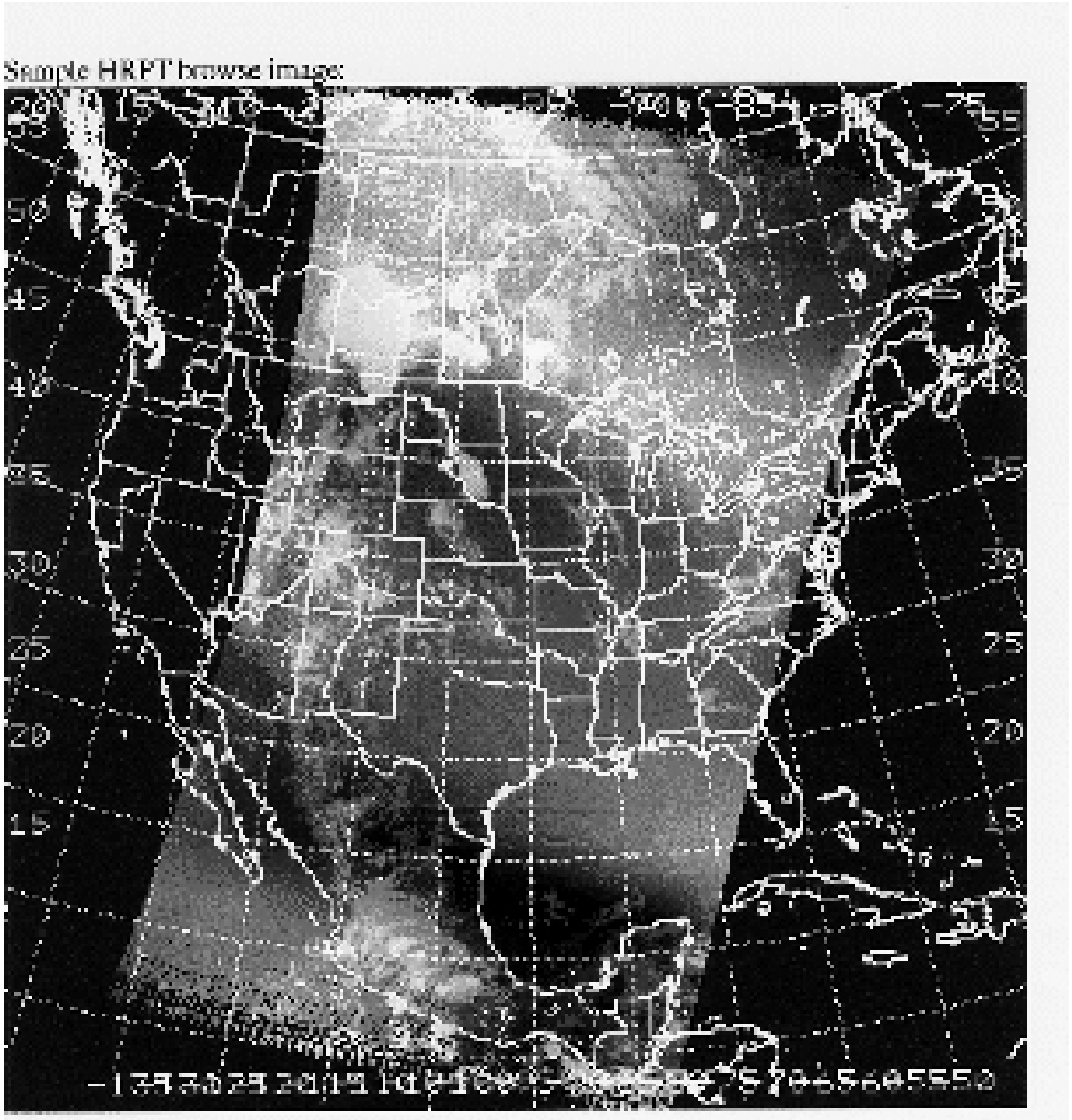
Bill Emery and Dan Baldwin

University of Colorado, CCAR

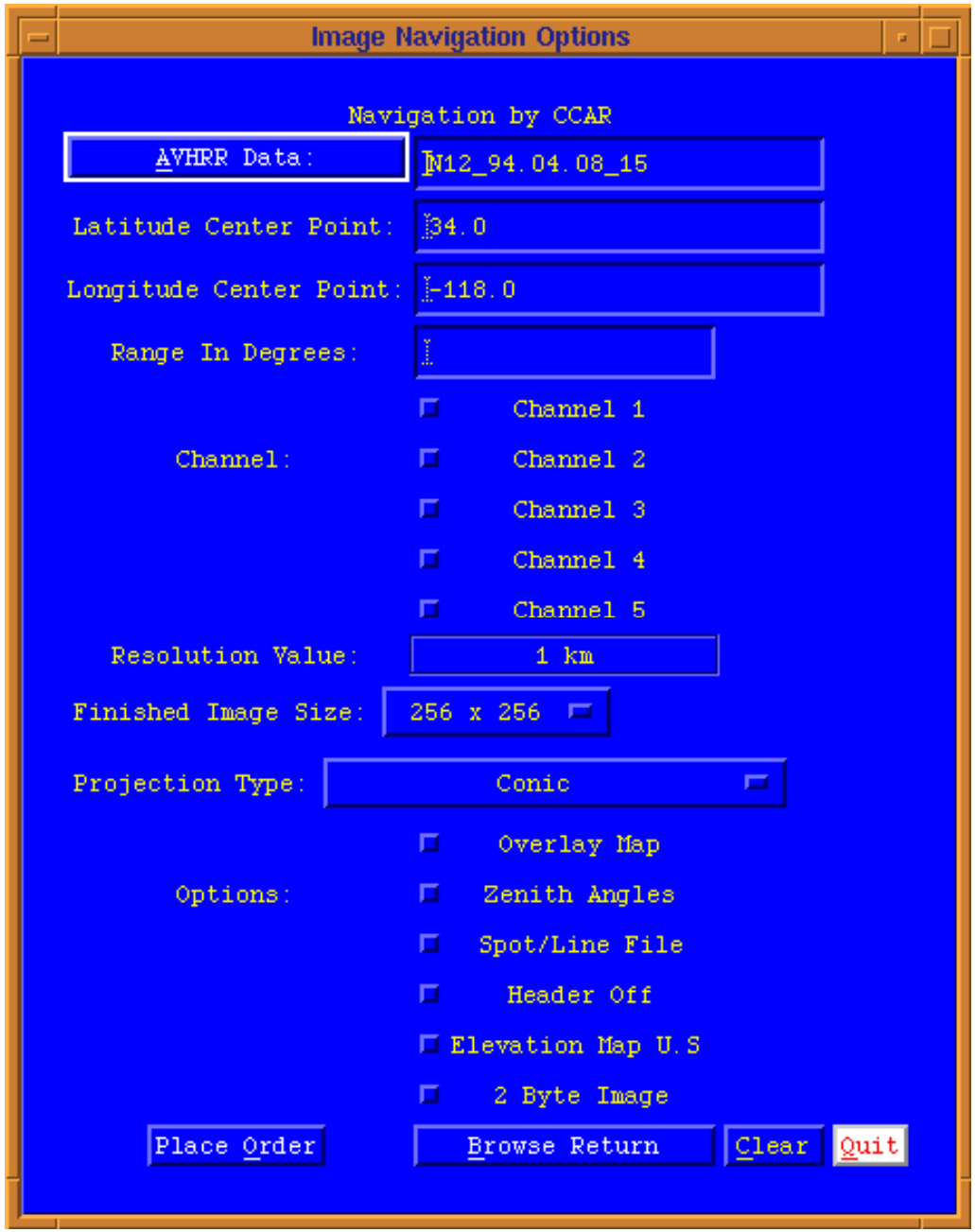
In the early days of NASA's EOS program satellite data were not easily available and we set up a system with NASA IDS funding to provide regional AVHRR data to the widest possible range of users.

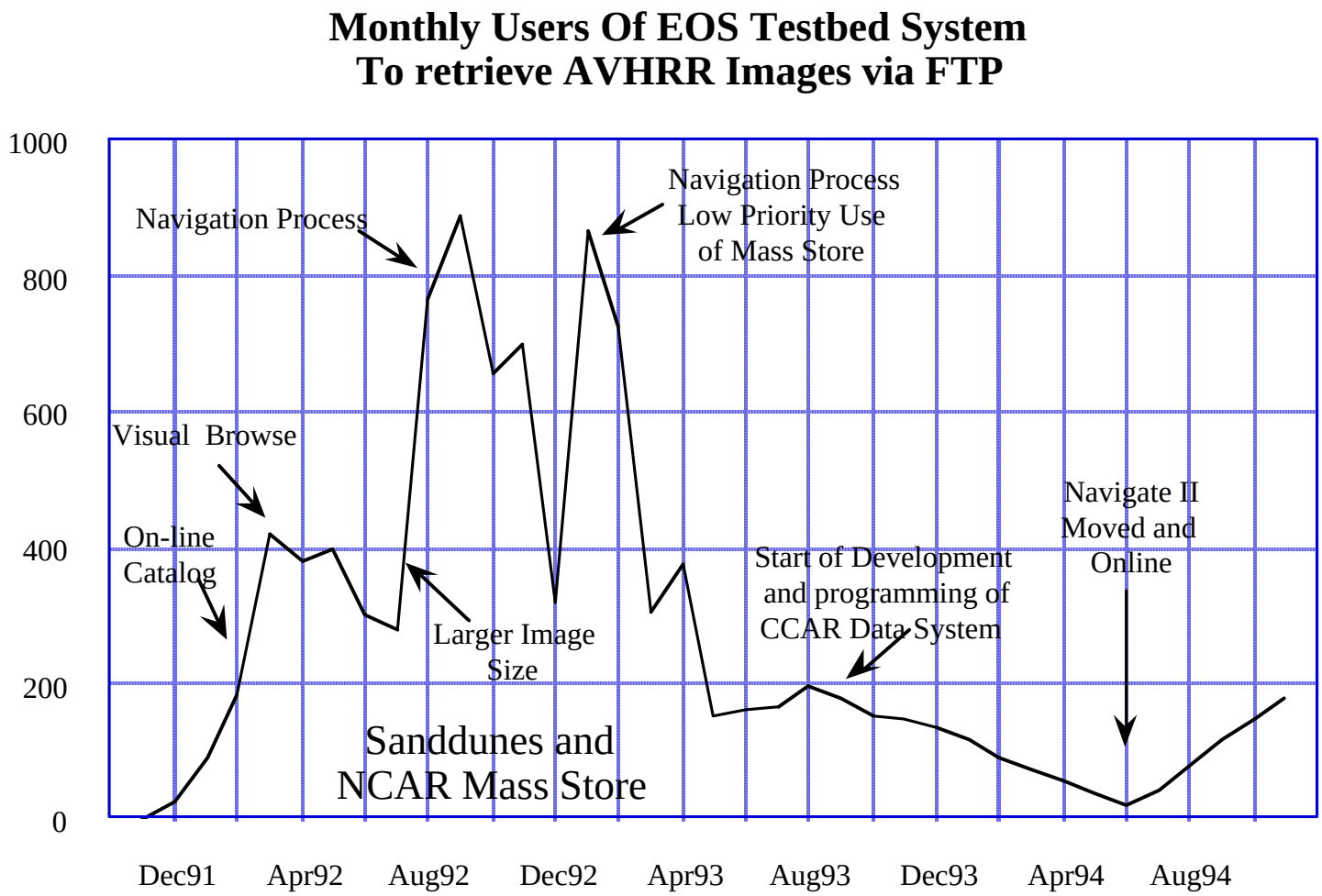
Installed Tracking and Geostationary Antennas

Browse image for HRPT pass from the tracking antenna.



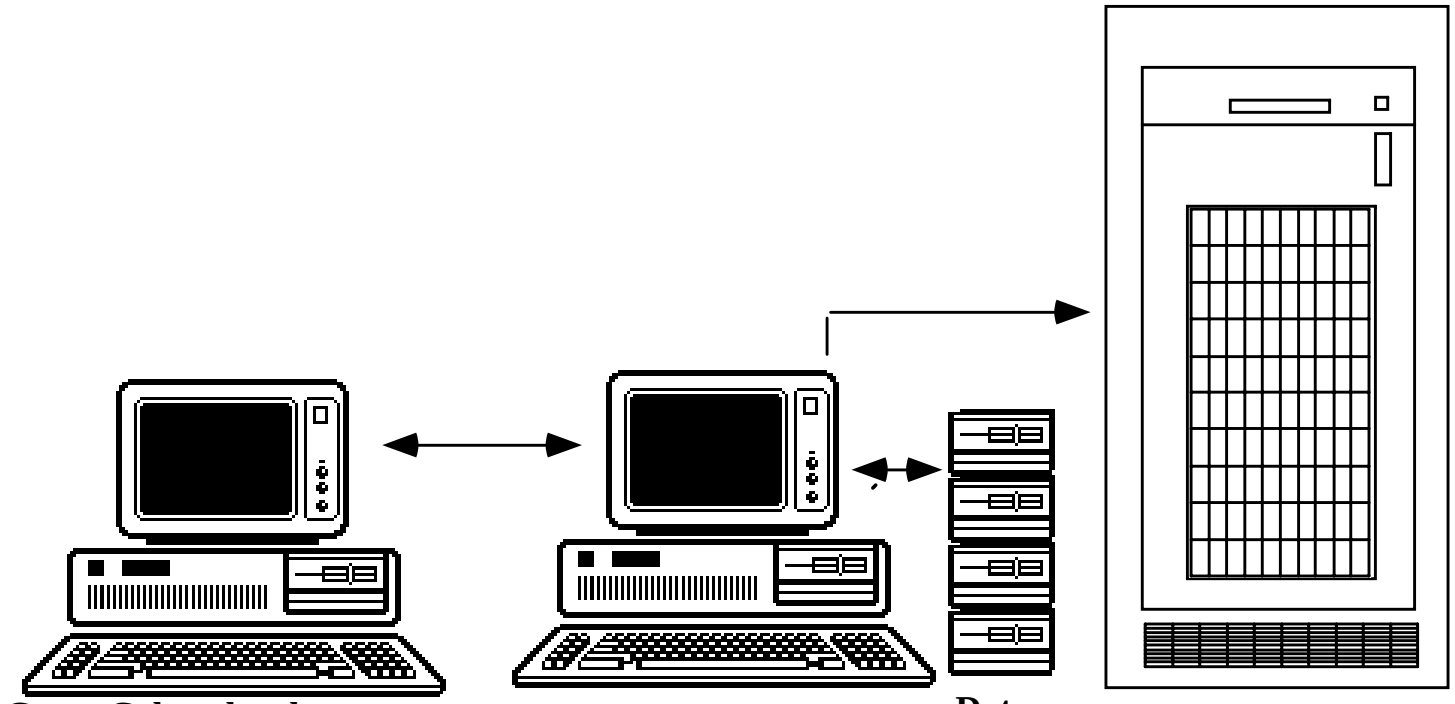
Order page for HRPT data allowing you to specify location and channels. You would still need to process the AVHRR imagery.





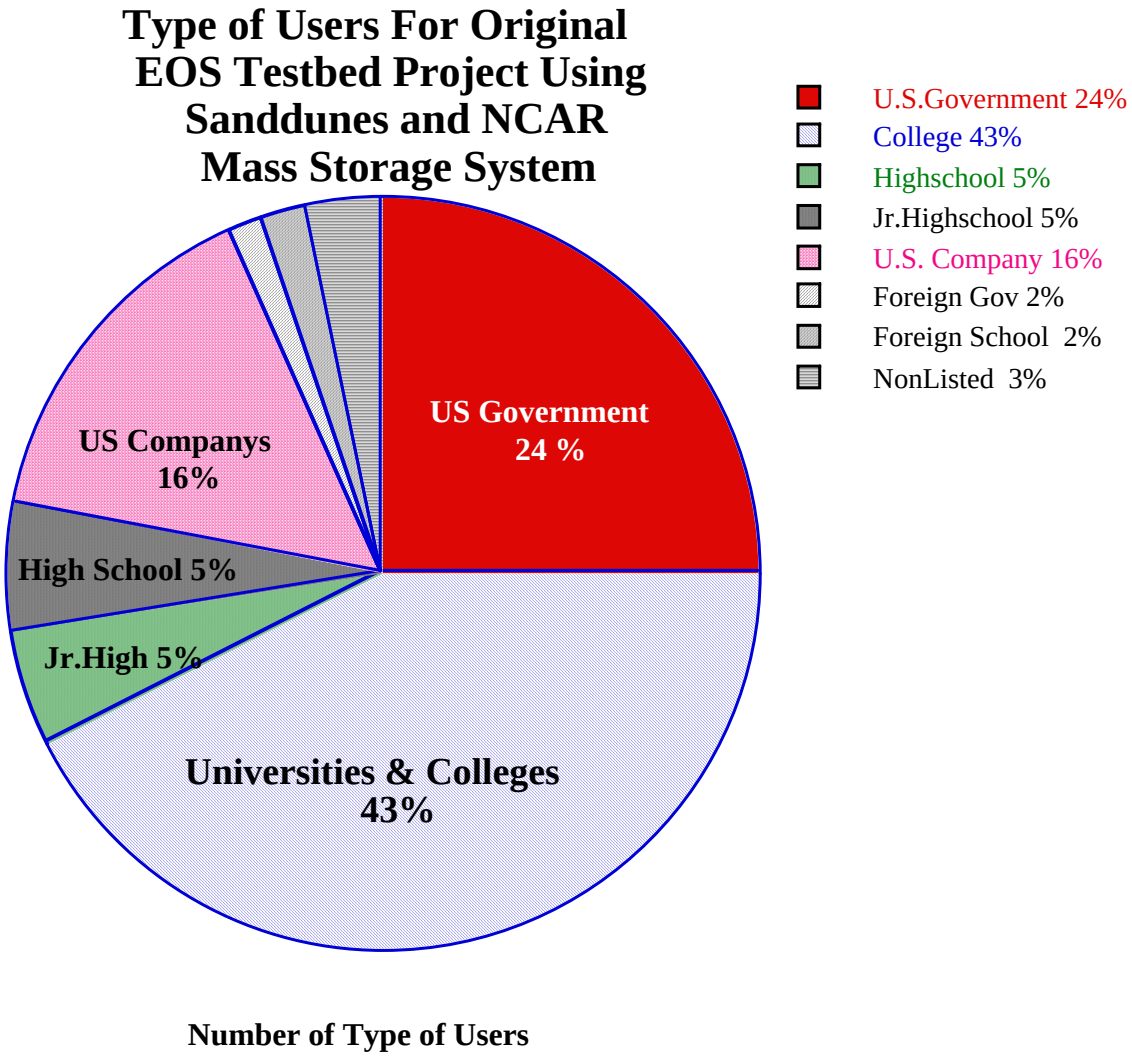
Older system using NCAR mass store

Navigate II System Design

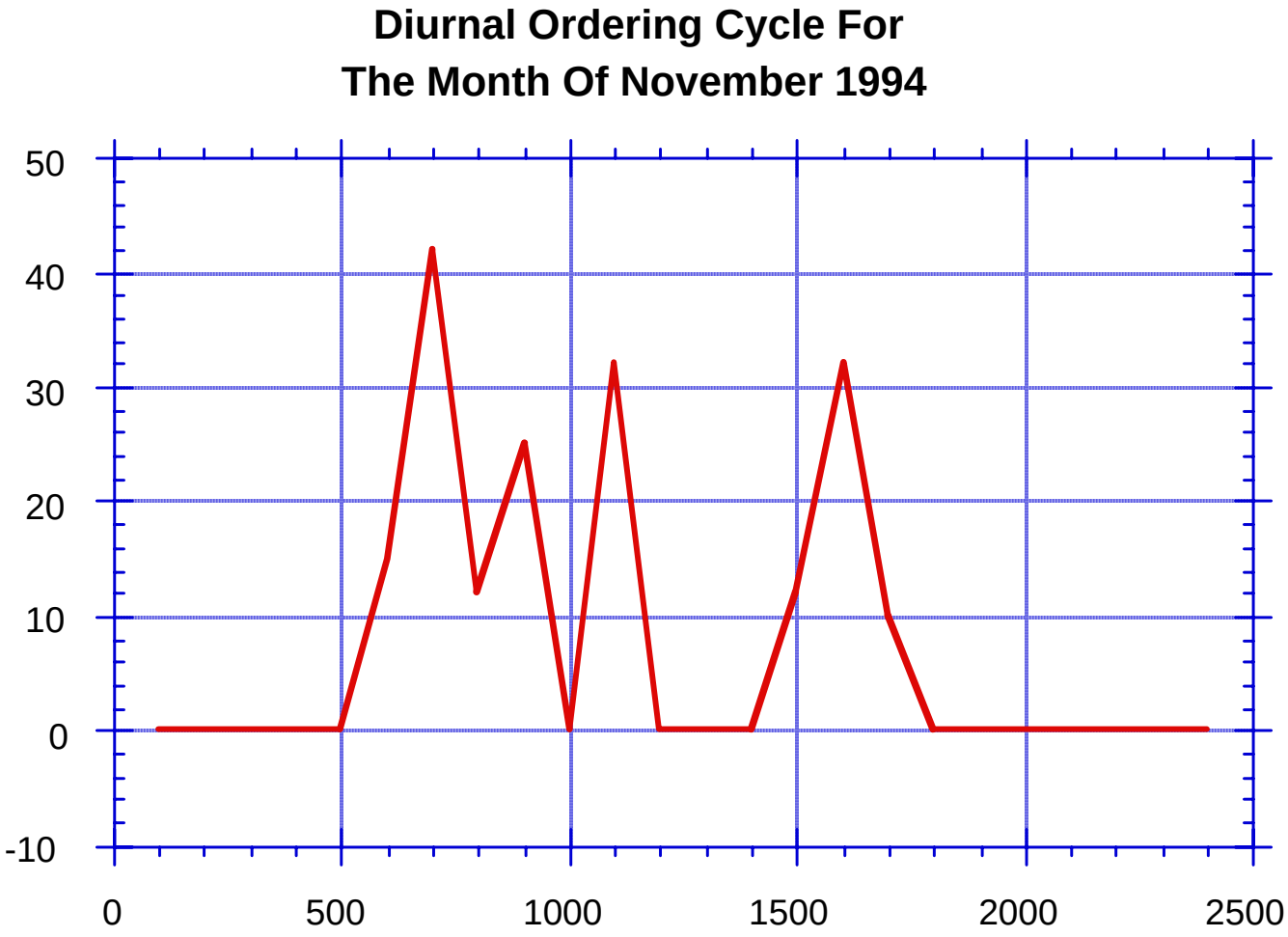


Stand alone system

Users of NCAR mass store system



Number of Type of Users

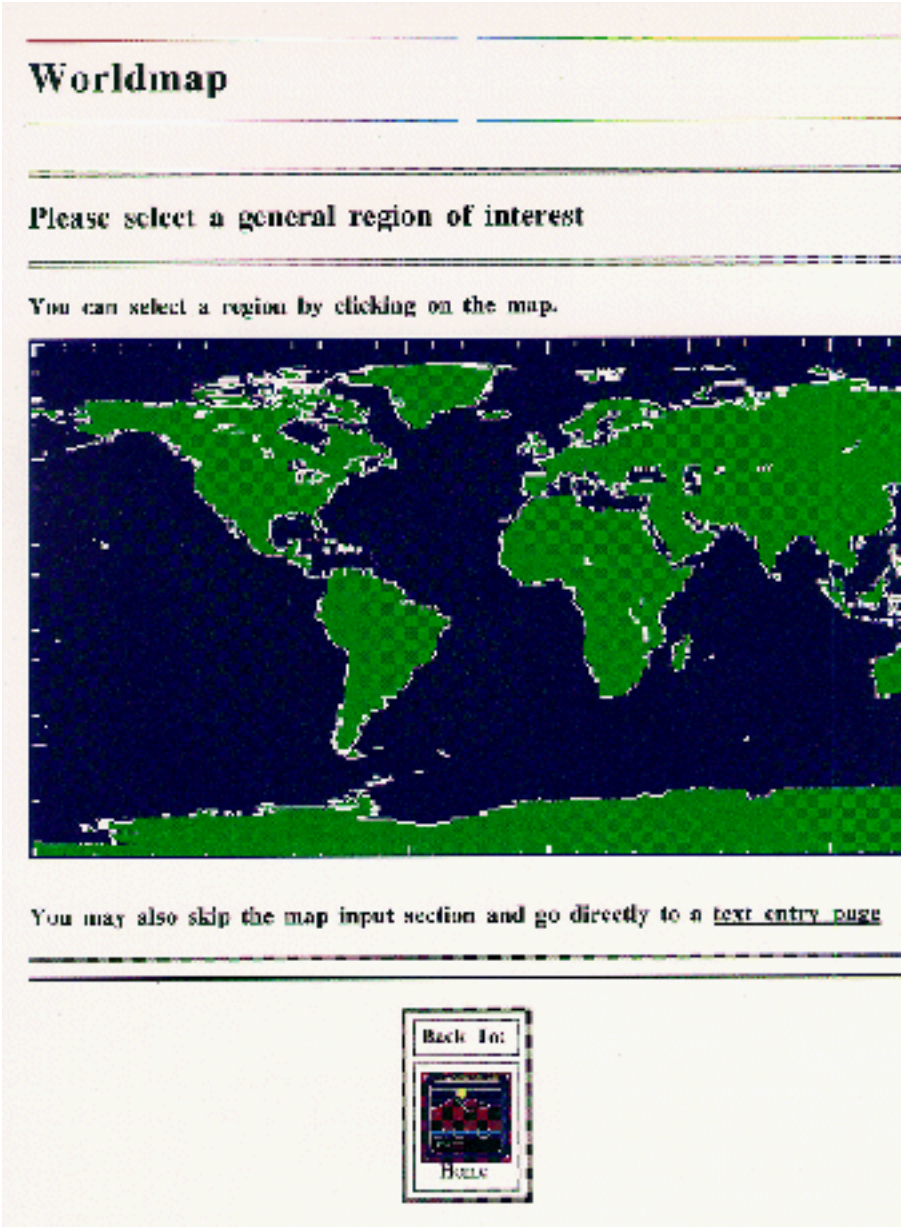


Diurnal variability of logins to the system

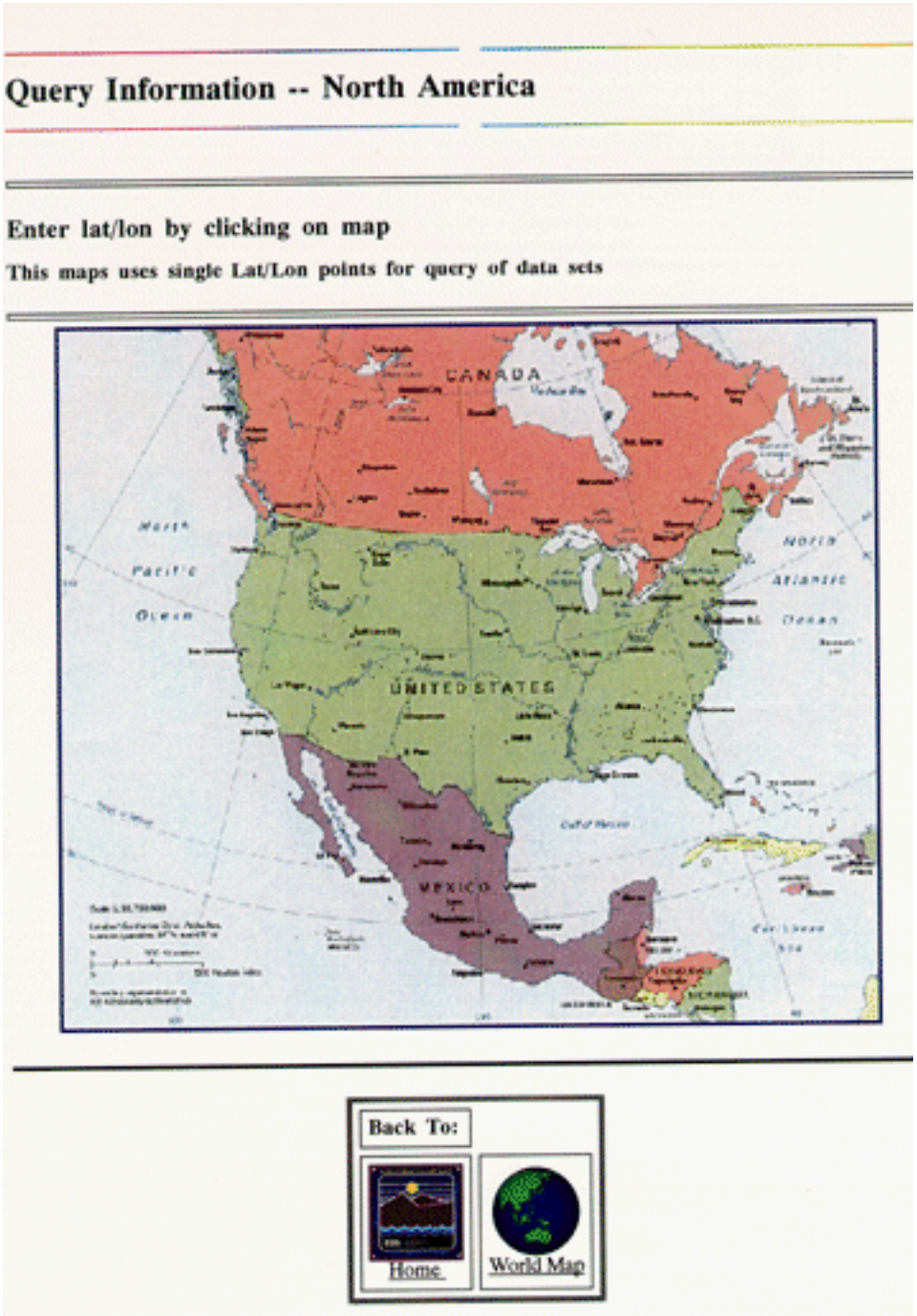
Installed a DOMSAT antenna to provide global area coverage

QuickTime™ and a
TIFF (Uncompressed) decompressor
are needed to see this picture.

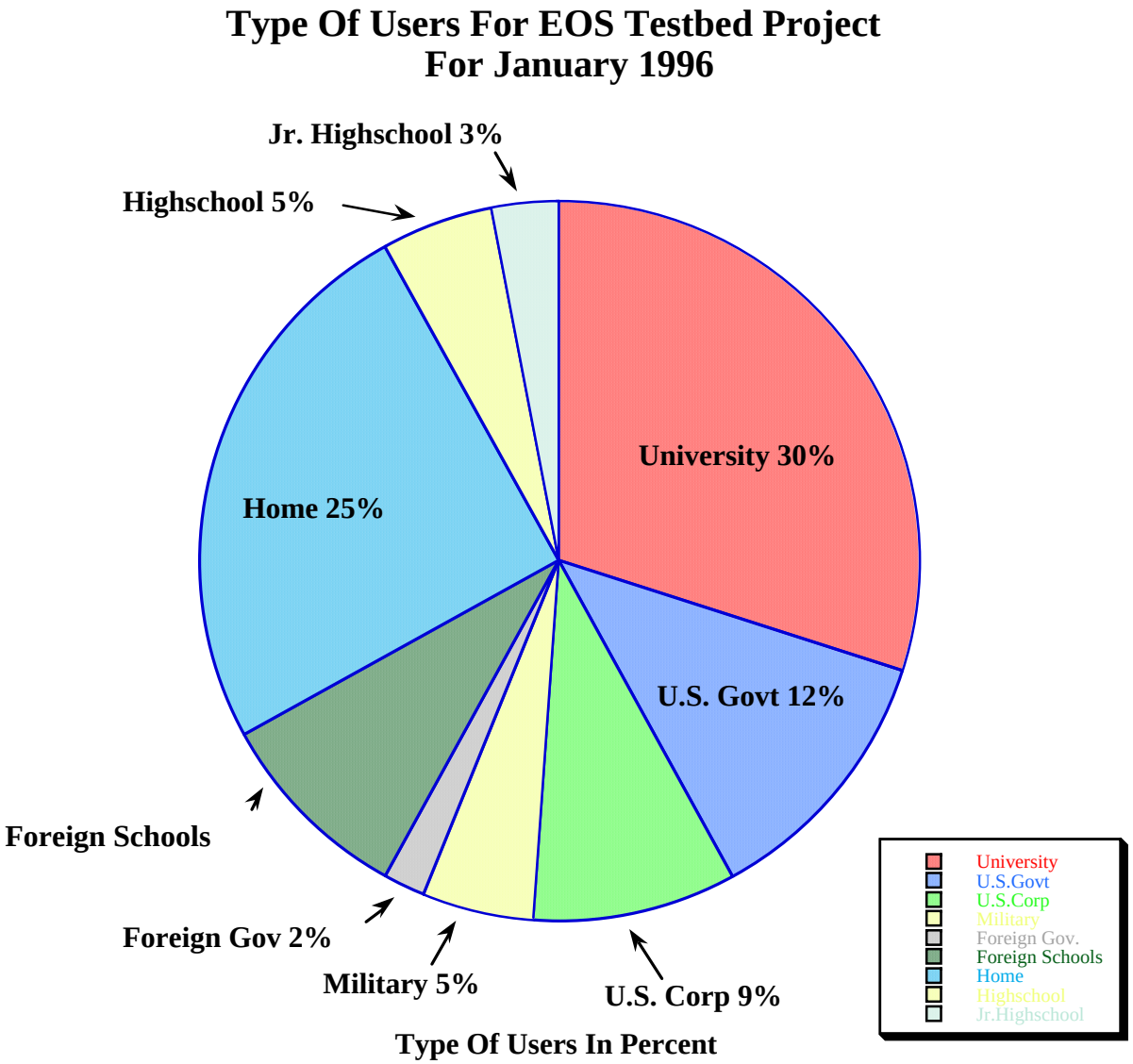
Moved to a web based system for the interface to the AVHRR GAC data



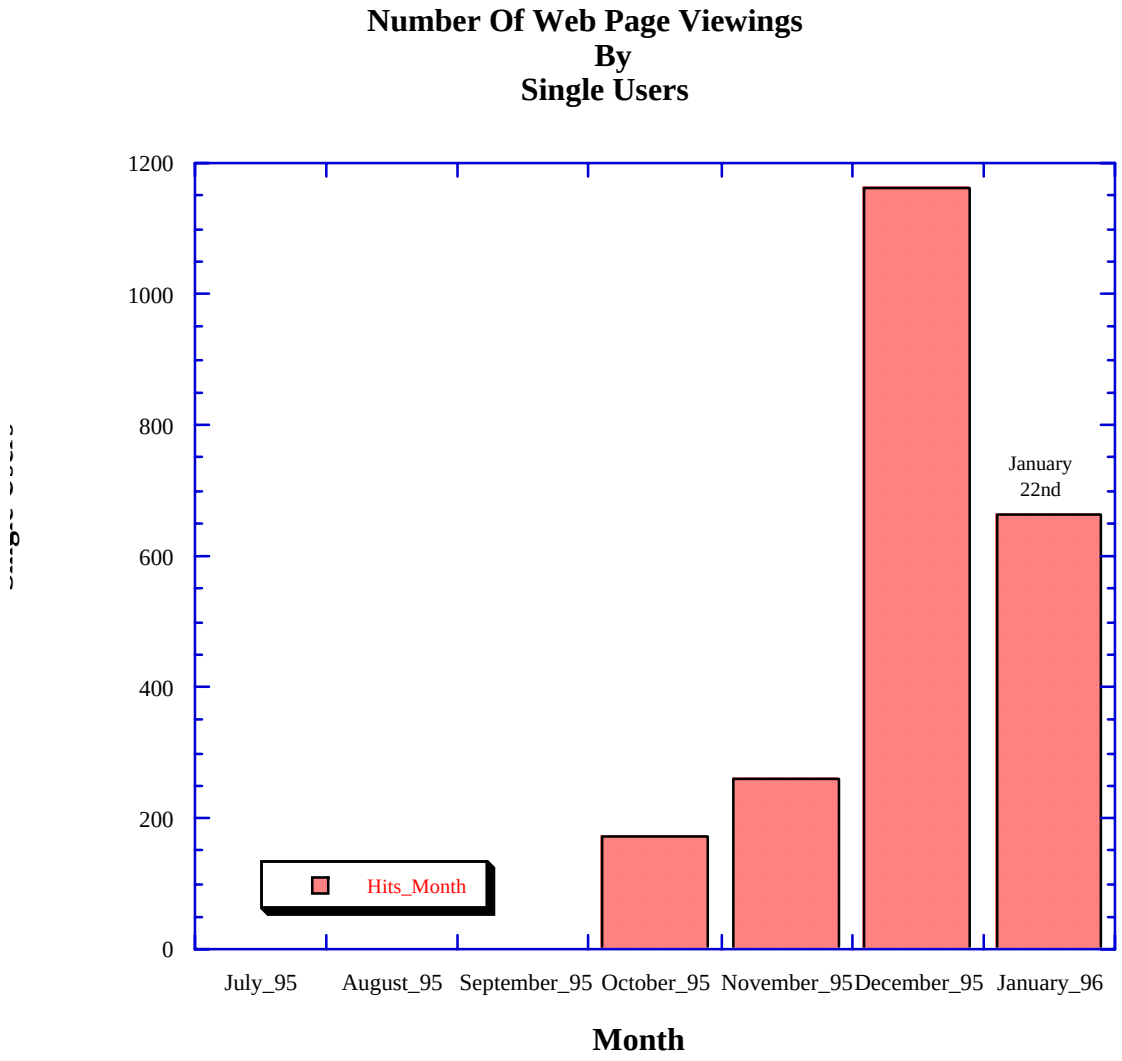
Need to select a continental region to download imagery



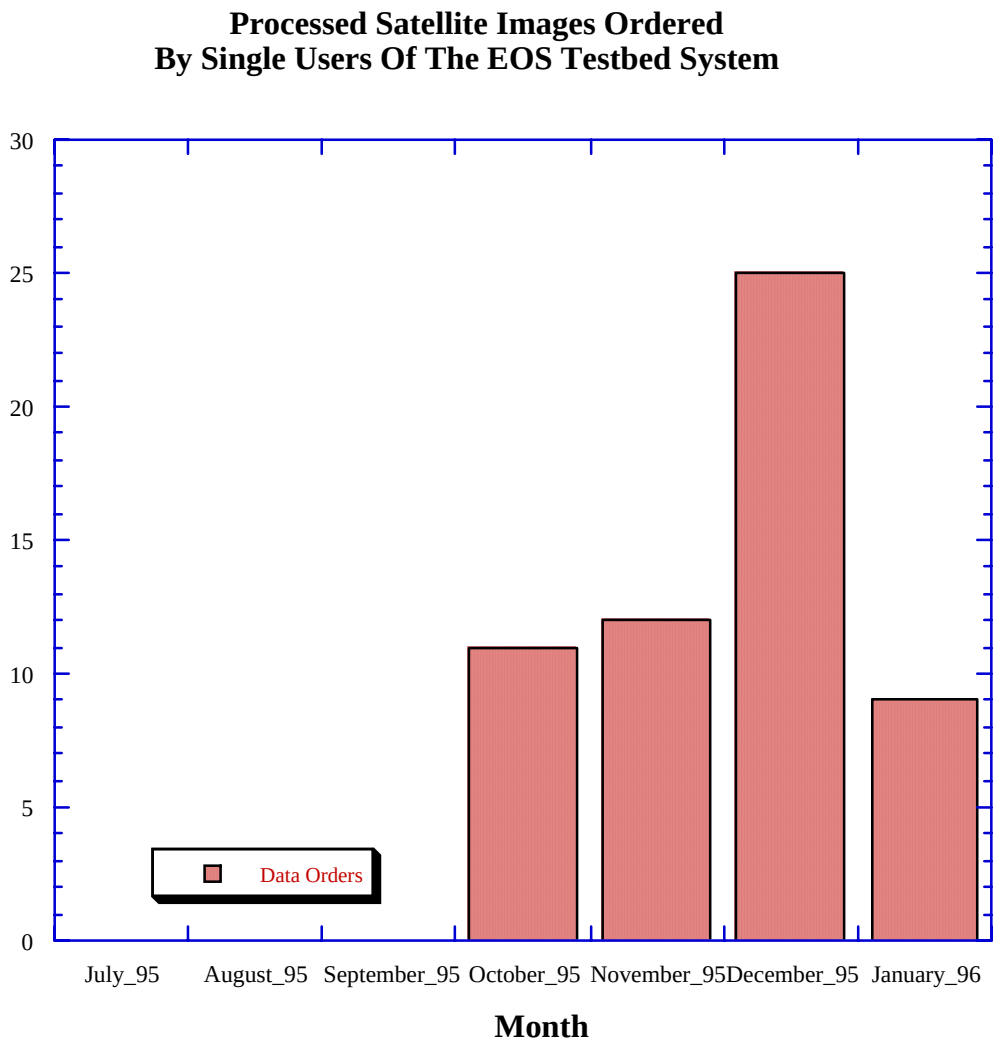
Users of new global system



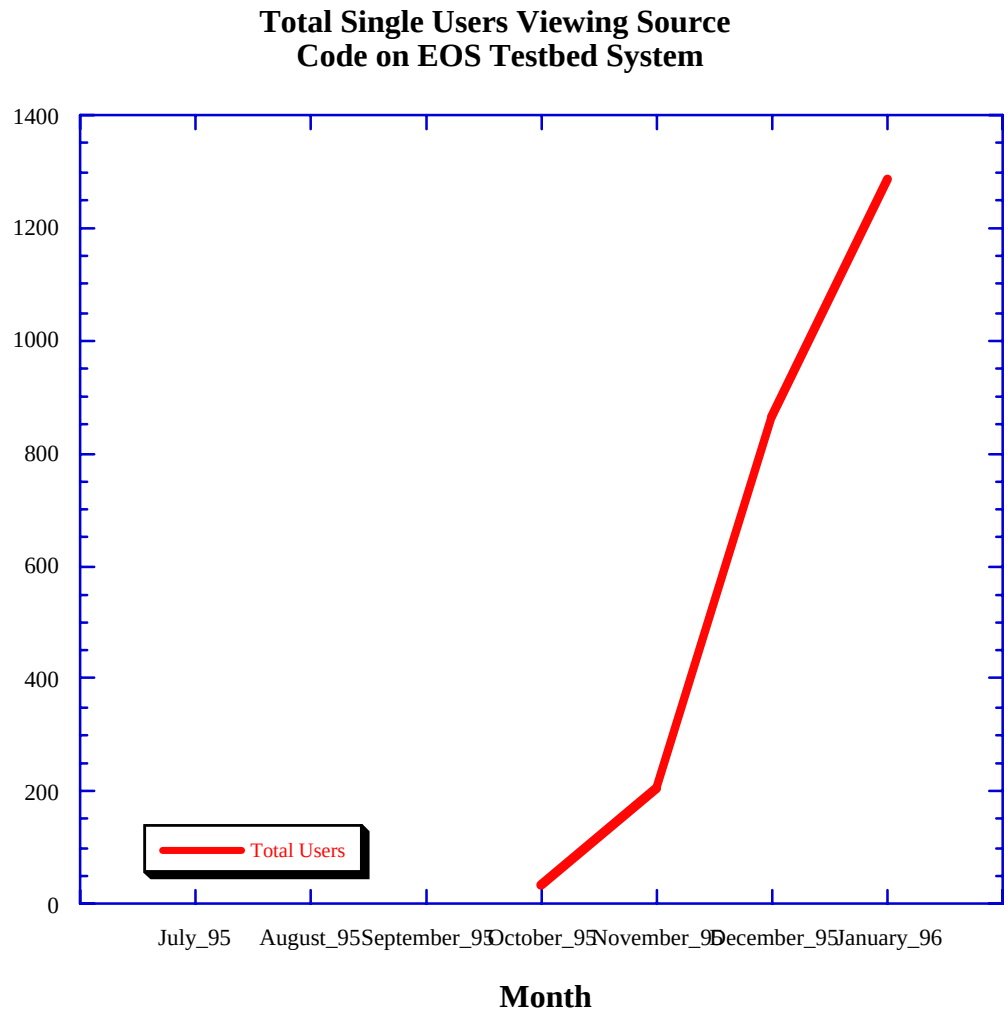
Number of web page viewing by month; system started in Oct. 95.



Satellite images ordered by single users of the system.



Growth of the system in late 1995.



Satellite Active Archive (SAA)

- **One of the real successes of EOSDIS was that it motivated NOAA to create the SAA to provide initially AVHRR-GAC data and now a wide variety of AVHRR GAC, LAC and HRPT data online and for free. This dramatically changed how people used AVHRR data.**

- **We turned off our data systems and shut down our antennas relying instead on the SAA to provide data for classroom and research needs**

An Essential Ingredient for SAA Data

- One tool critical to the routine use of SAA data is AVHRR image navigation which gives one the ability to map the satellite swath data into georegistered map imagery.

- Our group has provided software to do this image navigation to a large number of users who we continue to support with upgrades and modifications to the software.

Automated Image Navigation

- **We have recently created an automated AVHRR image navigation system that makes it possible to process a large number of AVHRR images without human intervention. We have done this so that we can maintain a web page that routinely and automatically processes a large number of U.S. west coast HRPT images each day.**

BASE IMAGE

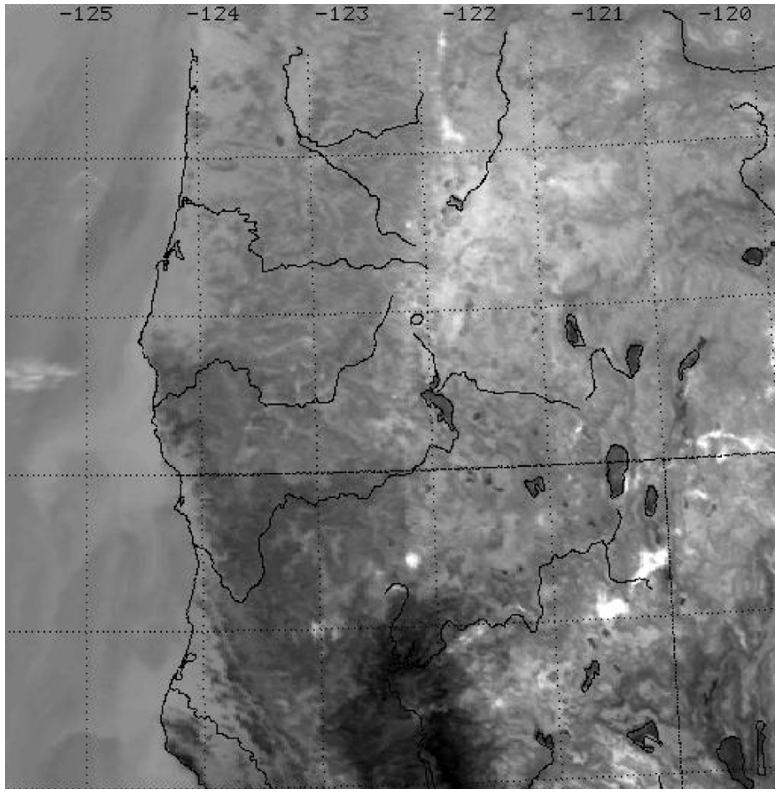
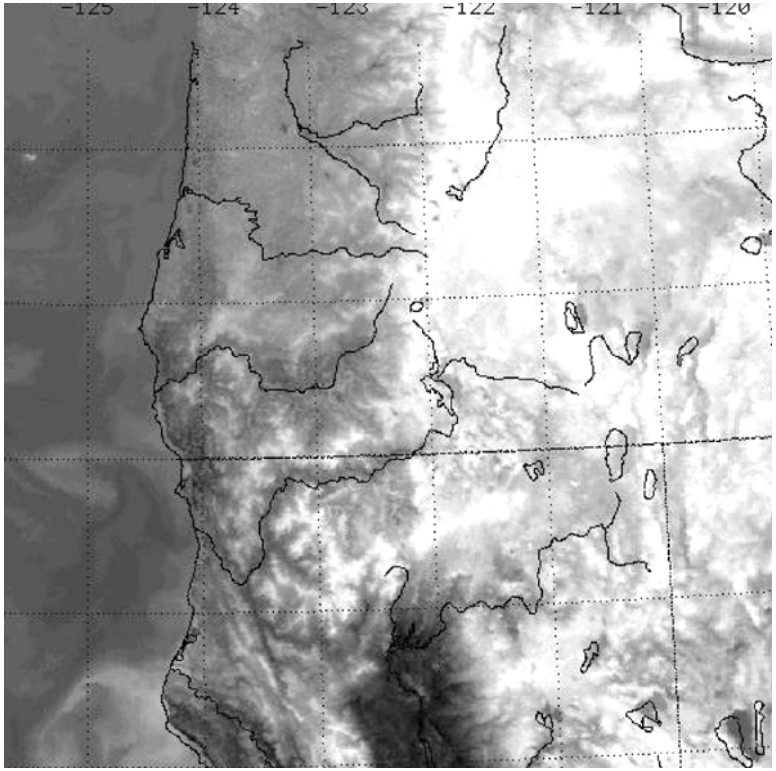
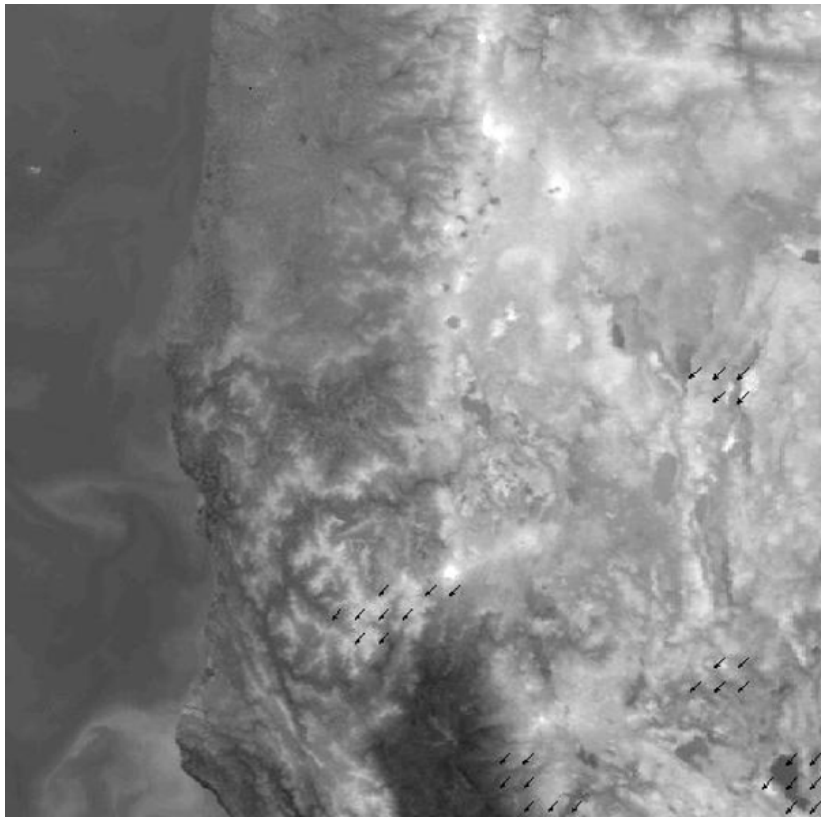


Image to Navigate

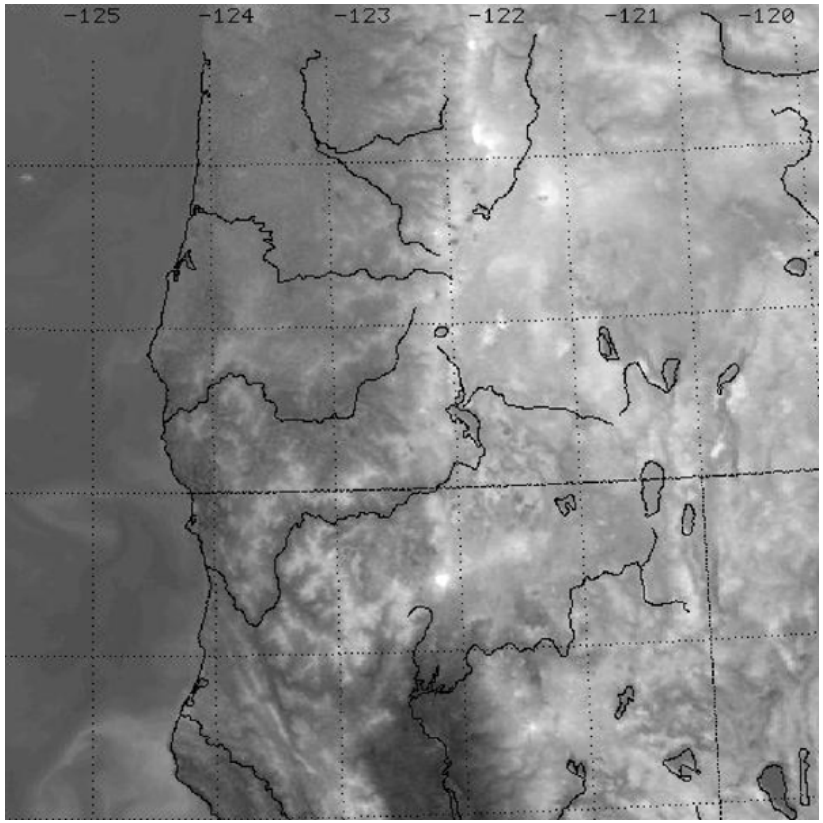


Aerospace Engineering

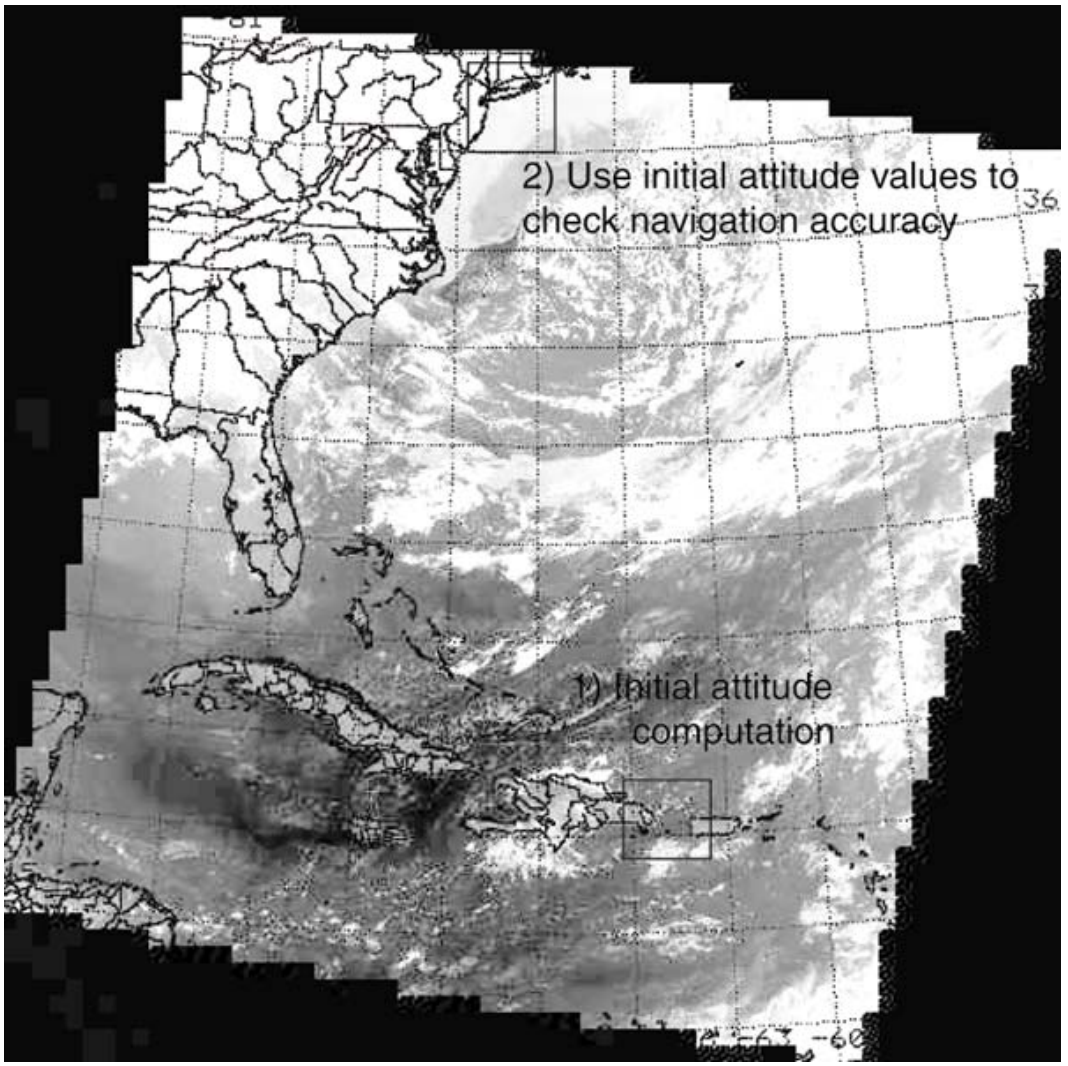
Image corrections computed from correlations and converted to attitude corrections



Navigated Image



An advantage of this method is that the attitude parameters can be computed for one part of a satellite orbit and then applied to a later portion of the orbit. This will work over water where there are no clear ground control points.



AVHRR Image Navigation Users

• Our image navigation software is used by a large number of groups in the U.S. and the rest of the world:

U.S.

GSFC (Land Pathfinder), U. Miami (Ocean Pathfinder), CU/NSIDC (Polar Pathfinder), EROS Data Center, National Wetlands Research Center, Univ of Wisconsin**,**

Non-U.S.

Amsterdam, Halifax, Calgary, Montevideo (2), Pretoria SA, Ottawa, Brazil (2), Toulouse, DLR/Germany, Portugal, Chile, Italy

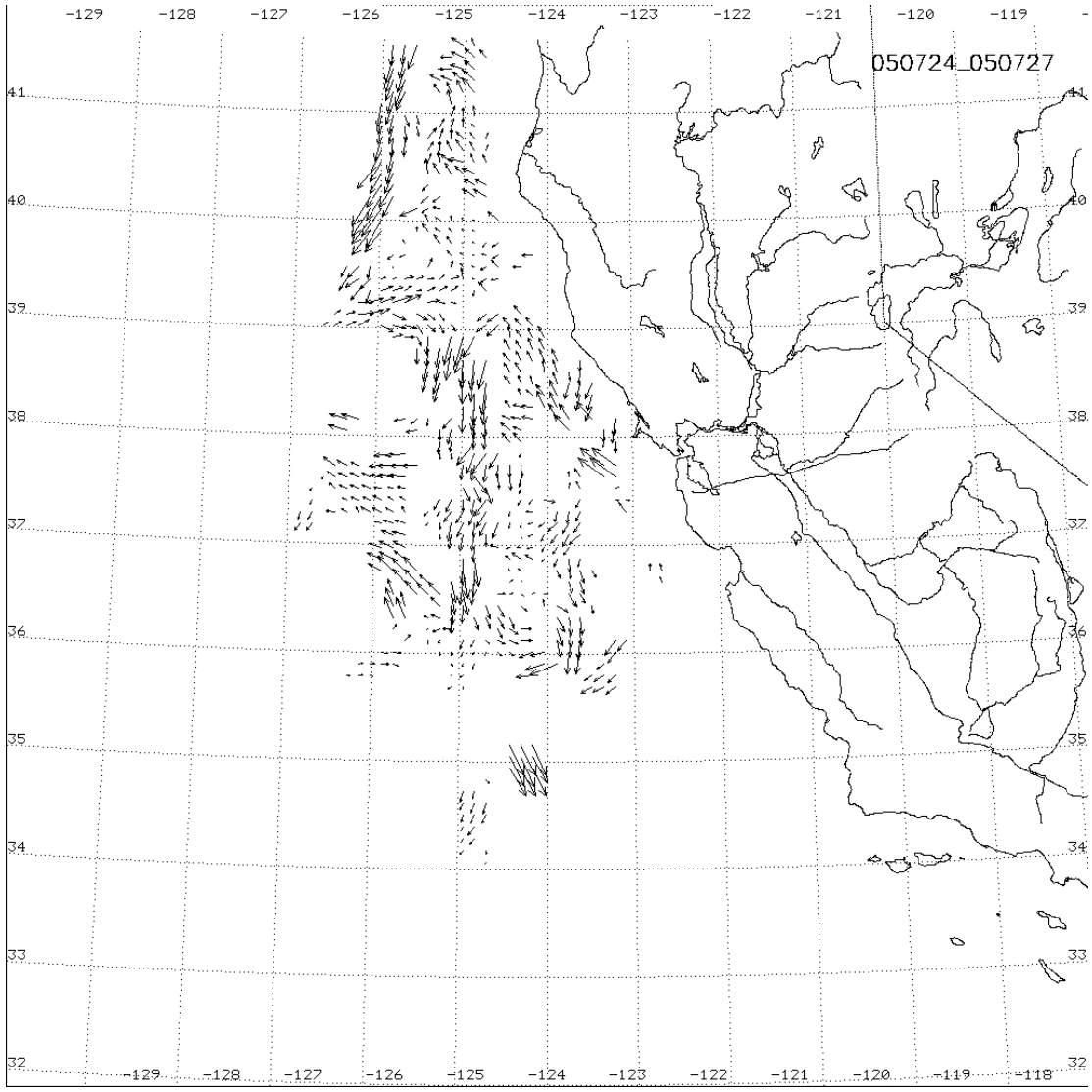
Real-time West coast Currents from AVHRR

• We have used this automated image navigation to automatically produce surface currents from infrared AVHRR imagery which is posted each 3 days on our web site along with an optimum interpolated field merged with satellite altimetry.

CCAR Real-time West coast Surface Currents

1

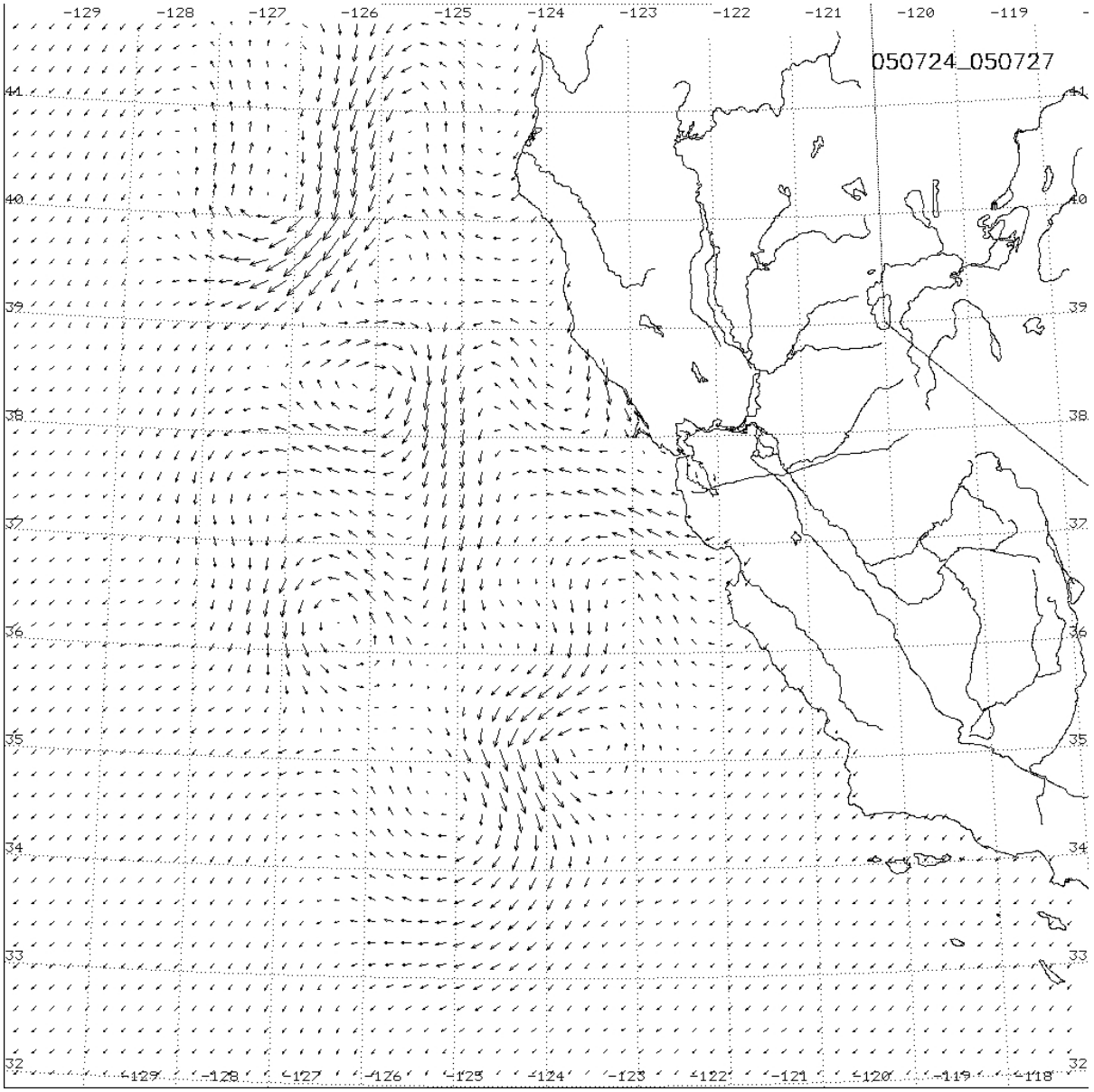
3-day composite of MCC currents only



Aerospace Engineering

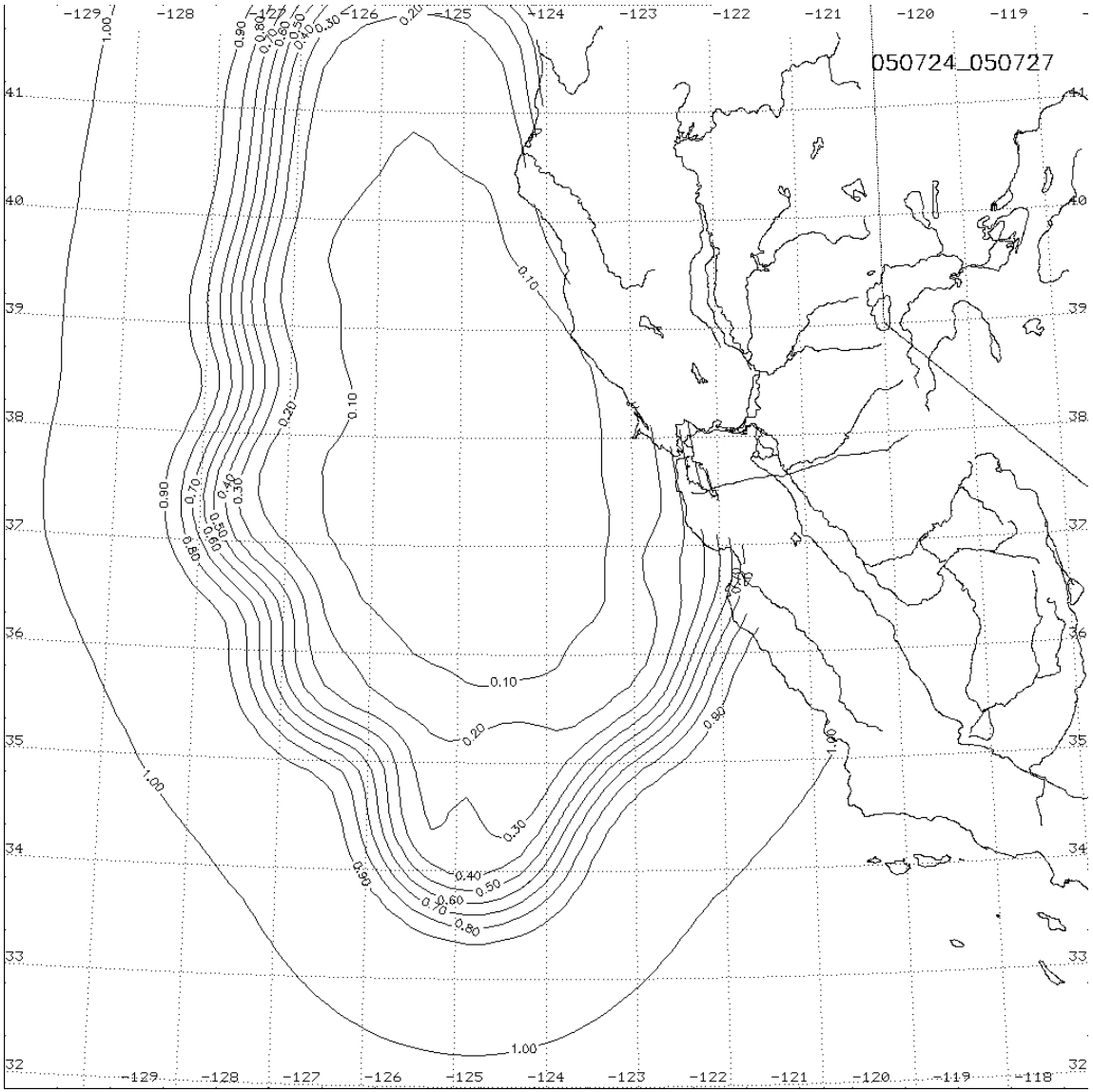
CCAR Real-time West coast Surface Currents 2

Optimum Interpolated Currents from MCC + Altimetry



CCAR Real-time West coast Surface Currents 3

Mapping error in the OI interpolation



Present Routine Uses of CLASS Data at CU/CCAR

- research project on skin and bulk SSTs
- polar sea ice (we have a full copy of the GAC archive from CLASS)
- research in wildfire detection, mapping and monitoring
- classroom research projects (ASEN 5337, ASEN 6220, etc.)

Processing Steps for CLASS Data

1. **Order and download level 1b AVHRR data**
2. **Determine if K, L, M or pre-NOAA-15 data**
3. **Reformat into native CCAR generic format**
4. **Verify time contiguity (one line every 1.6 sec LAC/HRPT), insert blank lines where needed**
5. **From telemetry data compute calibration gain and offsets and apply**
6. **Produce georegistered images with auto-nav**
7. **Apply processed (calibrated/navigated) images to application of interest.**

FUTURE WORK

- **Work with CLASS to enable users of AVHRR, GOES and other satellite data.**
- **Continue to develop and share tools for basic satellite data processing and analysis.**
- **Work with CLASS to help users realize the potential of working with these satellite data and help to overcome the natural resistance to working with large volumes of satellite imagery.**